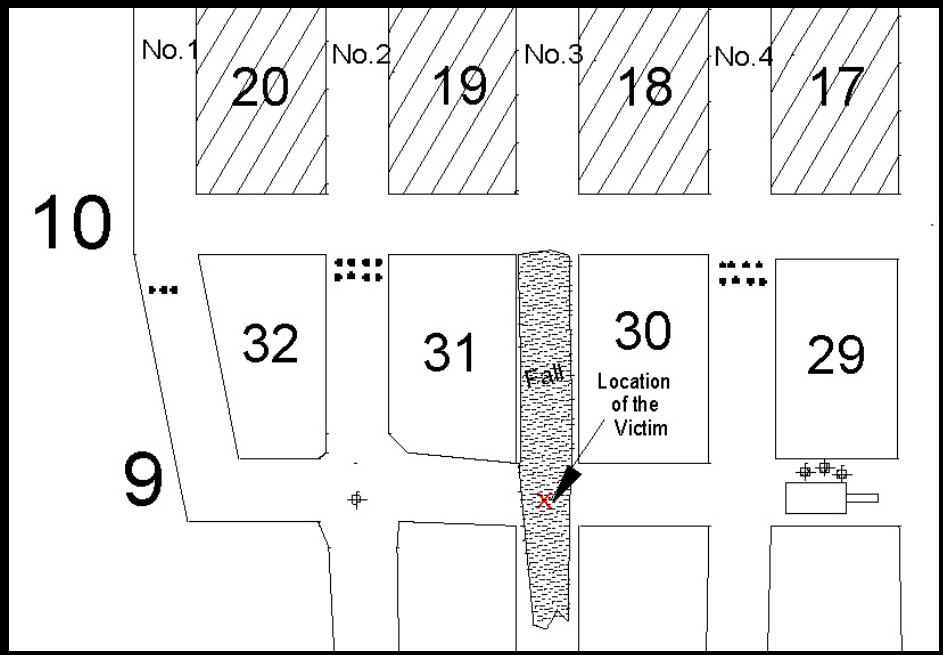
*This presentation is for illustrative and **general** educational purposes only and is not intended to substitute for the official MSHA Investigation Report analysis nor is it intended to provide the sole foundation, if any, for any related enforcement actions.*

GENERAL INFORMATION

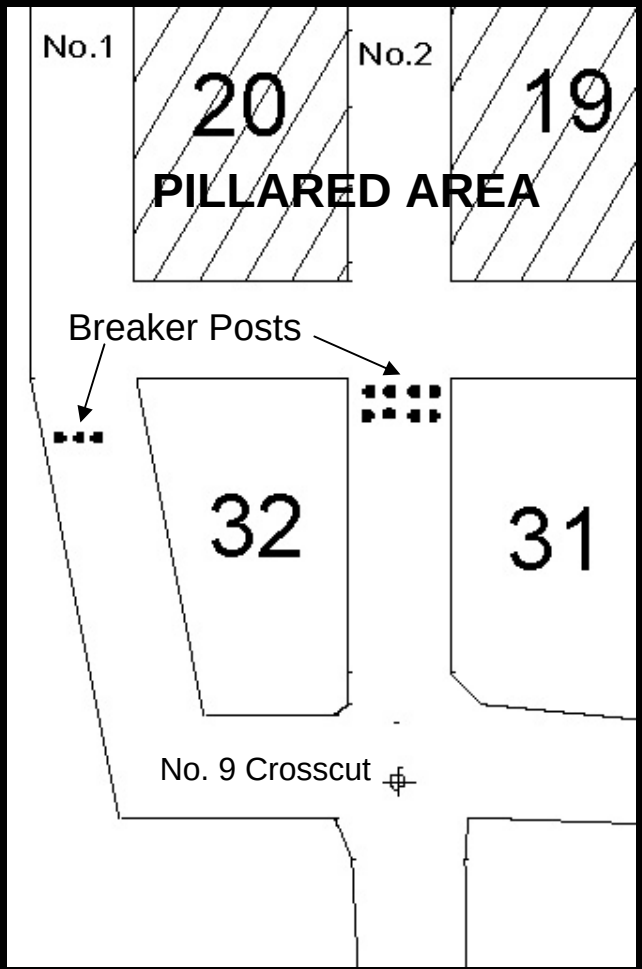
Coal Mine Fatal Accident 2003-28



Operator:	Roblee Coal Company
Mine:	Hacker's Creek Mine No. 1
Accident Date:	October 24, 2003
Classification:	Fall of Roof
Location:	District 3, Buckhannon, WV
Mine Type:	Underground
Employment:	21
Production	650 tons/day

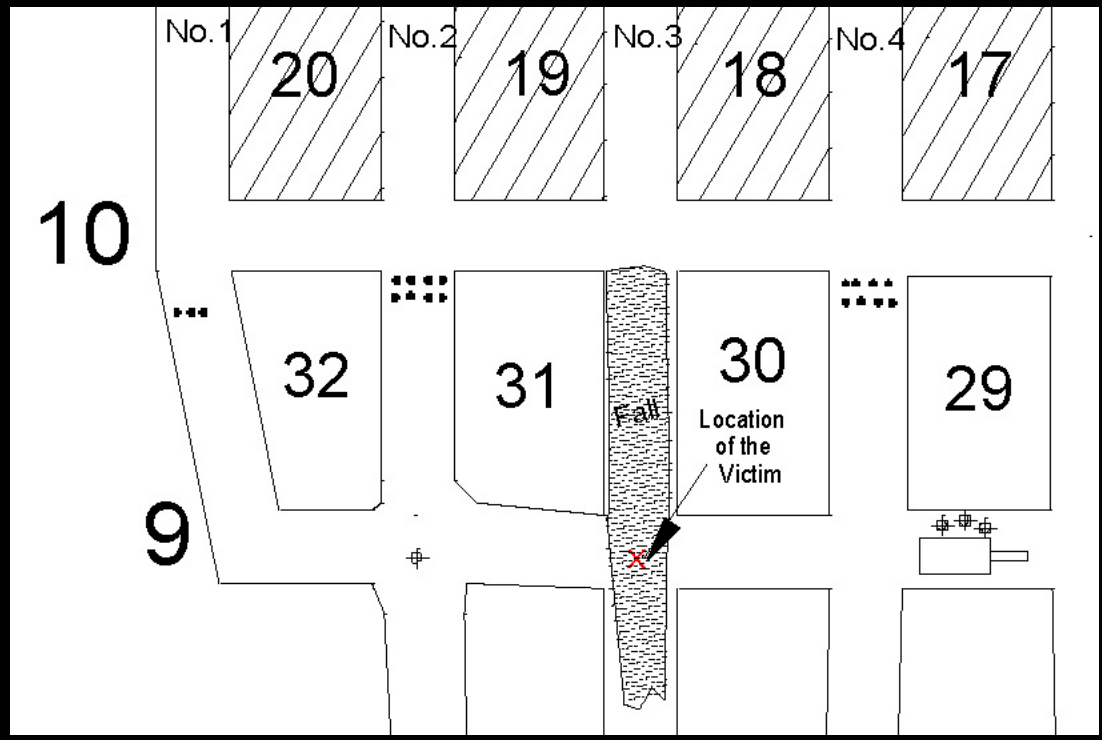
ACCIDENT DETAILS

Coal Mine Fatal Accident 2003-28



- Between 10:00 and 10:15 a.m., the mining machine was backed outby the pillar line after completing Block 20 and was being moved toward the right side of the section.
- A utility man and an electrician set three breaker posts in the No. 1 entry just outby the No. 20 block, when the roof began to work and fall behind the gob curtain in the No. 2 entry.
- The electrician looked behind the gob curtain in the No. 2 entry and observed that the fall had knocked out the inby row of breaker posts. He then rejoined the utilityman at the intersection of the No. 2 entry and the No. 9 crosscut.

ACCIDENT DETAILS



- As the roof began to work again, the utilityman ran toward the mining machine and other crewmembers on the right side of the section through the No. 9 crosscut.
- As the utilityman reached the No. 3 entry, he was struck by a roof fall that extended 1½ crosscut from the pillared area.
- Crew members yelled for the victim, but there was no response. The victim was recovered at 8:15 p.m.

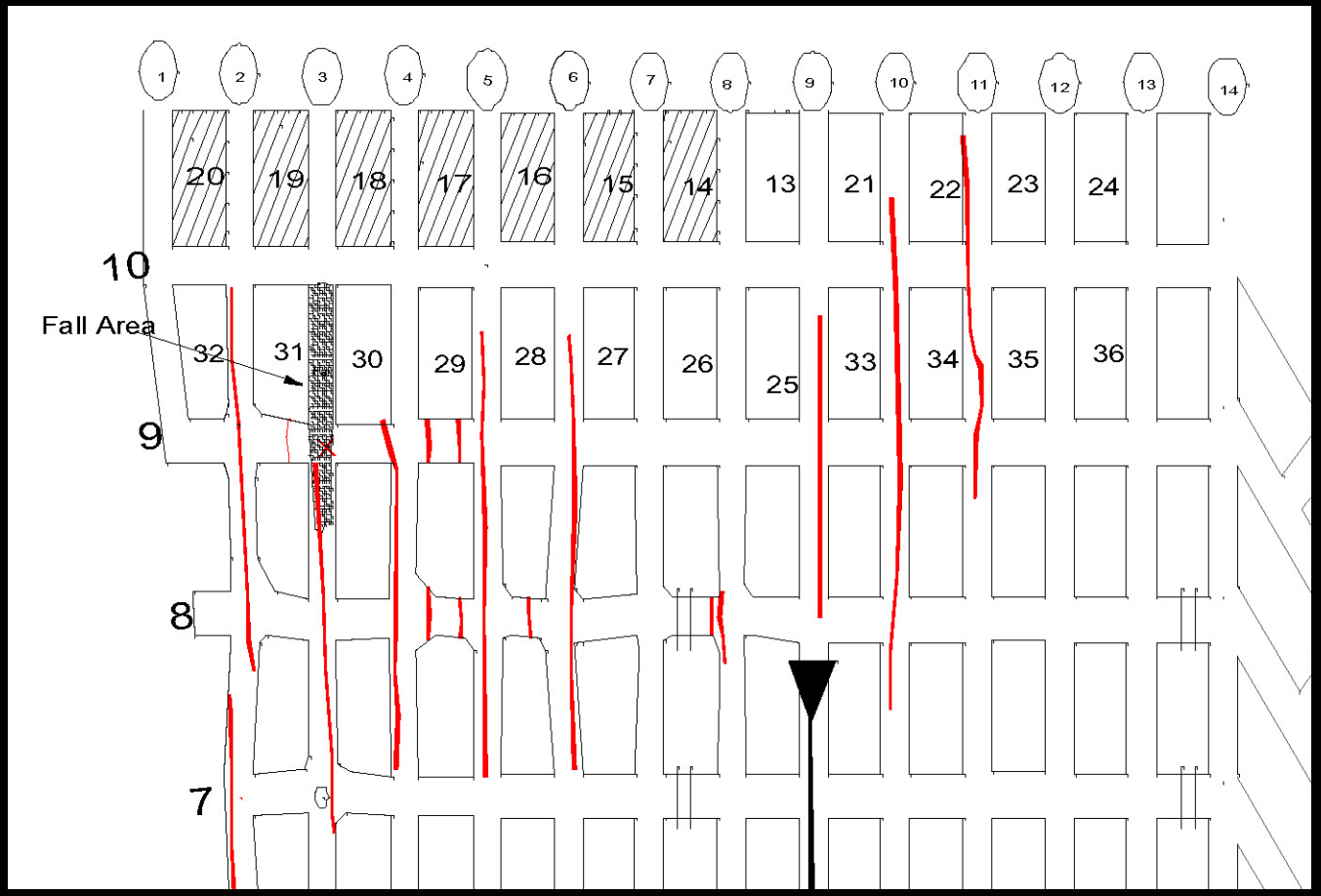
GEOLOGIC CONDITIONS

- The accident site was located under a narrow ridge, 920 feet wide from outcrop to outcrop.
- The Redstone coal seam averaged 60 inches thick and overburden thickness averaged 137 feet at the accident site.
- No mining had been conducted above or below the mine in the immediate area.
- The fall extended outby from the pillared area and measured 96 feet long, 14 feet wide, and 5 feet high. The fallen roof material was composed of thinly laminated dark gray shale and sandstone which predominately remained intact as one massive block. In the days following the accident, more material fell from the inby portion of the fall cavity toward the pillared area.

GEOLOGIC CONDITIONS

- The left side of the fall was bounded by a near vertical, weathered stress-relief joint, often referred to as a hillseam or surface crack.
- This joint was approximately 3 to 5 inches wide and had been in-filled with rock and soft, clay-like material. There was also considerable iron-oxide staining visible.
- The extensive joint resulted in a detached block, cantilevered from the opposite side pillar. Abutment pressures from second mining overloaded the cantilevered beam and caused the failure in conjunction with a fall that originated within the pillared area. This same joint continued outby the fall area for approximately 120 feet where it angled over a coal pillar.
- The right side of the fall broke along the outside bolt row in the entry, and while generally vertical, was more jagged than the smooth vertical surface on the weathered-joint side of the fall. The outby side of the fall was also somewhat jagged, and feathered out.

GEOLOGIC CONDITIONS



- Numerous other weathered joints were present throughout the section. Several of these were gapped as much as 5 inches. The joints typically ran North East.

ROOF CONTROL PRACTICES

- The approved roof control plan permitted a maximum entry width of 18', except when within 100' of an outcrop, where the plan specified a reduction to 16' wide entries and crosscuts.
- Widths were measured up to 16'-8" inches in the No. 1 Entry and 17'-4" inches in the No. 2 Entry. Since these entries were within 100' of the highwall, the maximum approved widths were exceeded in both cases. This did not contribute to the accident as the roof at these two locations was solid and in a reasonably good visible condition.
- The accident site was developed in October 2001.
- The roof was supported with Grade 60, 5/8-inch diameter, 60-inch long, fully grouted, headed rebar roof bolts, installed with 8-inch square, donut embossed, Grade 2 bearing plates.
- Outby the accident site in the No. 3 entry, and in several of the adjacent entries and crosscuts, where two parallel surface cracks were observed, straps were installed across the cracks as required in the approved roof control plan.
- Roof bolts were typically installed on closer centers than required in the plan (5' max. between rows by 4½' between bolts within a row).

ROOF CONTROL PRACTICES

- Prior to the recovery of the victim, a similar fall occurred in the No. 5 entry. This fall was present at the time the accident investigation team arrived on the section.
- Although it cannot be specifically determined when this fall occurred, the fall was not reported in pre-shift record book. The fall extended from the pillared area, through the breaker posts, and outby in the entry. It stopped prior to the intersection in the No. 9 crosscut.
- At some time in the two days following the accident, a roof fall also occurred in No. 2 entry. This fall was also bounded by a weathered stress-relief joint on the left side and mirrored the fall in No. 3 entry, but did not continue into the last open crosscut.

ROOT CAUSE ANALYSIS

Causal Factor: The standards, policies, and administrative controls in use at the mine did not ensure that the roof was supported or adequately controlled to protect persons from the hazards associated with falls of roof. There were one dozen surface cracks on the 1-Left pillar section ranging from 1 to 5 inches wide and several feet in length located throughout the section. A roof fall similar to the fall that resulted in the death of the victim was present in the No. 5 entry. The overall roof conditions on the section were such that additional measures to support the roof should have been implemented.

Corrective Actions: The approved roof control plan was revised to include the following measures necessary to be implemented during pillar mining when surface cracks are present: (1) The minimum number of breaker posts has been increased from 8 to 12, and (2) A minimum of six cable bolts eight feet in length are required to be installed in the intersection outby the pillar block prior to pillar mining. The increase in the minimum number of breaker posts and the installation of cable bolts in the intersection minimizes the likelihood of a fall in the gob riding out into the intersection.

ROOT CAUSE ANALYSIS

Causal Factor: The pre-shift examination of the roof conditions in the 1-Left Pillar Section was deficient in that it failed to identify hazardous roof conditions so that corrective measured could be initiated. The surface cracks across the section were extensive in nature. A review of the preshift examination record books did not contain any comments or indication of the presence of surface cracks or adverse roof conditions. An adequate examination would have recognized the surface cracks as a hazardous condition for work scheduled in the area, which included retreating the pillar line toward these surface cracks. Identifications of these conditions during the preshift examination should have prompted the installation of additional roof support or abandonment of the area that was mined.

Corrective Actions: The certified persons making the examinations should properly identify and record all hazardous conditions and make the appropriate corrections. Mine management should develop and follow procedures to identify and correct any and all hazardous conditions. Management should be aware that simply not entering hazardous conditions into the on-shift records is unacceptable.

CONCLUSION

The accident occurred because hazardous roof conditions on the working section were not identified and corrected. A near vertical, weathered, stress-relief joint on the left side of the No. 3 entry resulted in a detached block that cantilevered from the opposite side pillar. Abutment pressures from second mining, in conjunction with a fall that originated in the pillared area and that overrode the breaker posts, caused failure of the cantilevered beam.

ENFORCEMENT ACTIONS

Section 104(a) Citation for a violation of 30 CFR 75.202(a)

The roof was not adequately supported or otherwise controlled to protect persons from the hazards associated with falls of roof on the 1-Left Pillar Section. Surface cracks ranging from one to five inches in width were present at the following locations:

- No. 2 entry - from the No. 10 row to the No. 6 row, a distance of approximately 280'.
- No. 2 to No. 3 crosscut in the No. 9 row - rib to rib, a distance of approximately 18'.
- No. 3 entry - beginning even with the No. 9 row and extending outby for a distance of 140'.
- No. 4 entry - just inby the corner of the No. 4 to No. 3 crosscut in the No. 9 row, extended outby for a distance of 140', making the crack 158' in length.
- Crosscut No. 5 to No.4 in the Nos. 8 and 9 row of blocks - extended from rib to rib (two in each crosscut).
- No. 5 entry - just outby the No. 10 row of blocks, outby for a distance of 175'.
- No. 5 to No. 6 crosscut in the No. 8 row of l blocks - rib to rib, a distance of approximately 18'.
- No. 6 entry - between the No. 9 and No. 10 rows outby to the No. 7 row, a distance of approximately 175'.
- No. 8 entry in the No. 8 row - two surface cracks running parallel to each other for a distance of 18'. The surface crack farthest to the right extended outby for an additional distance of 5',
- No. 9 entry between the No. 9 and No. 10 rows - outby for a total distance of 140'.
- No. 10 entry between the Nos. 10 and 11 blocks - outby 200' to a location in between the No. 7 and No. 8 rows.
- No. 11 entry between the Nos. 10 and 11 blocks - outby 150' to a location in between the No. 8 and No. 9 blocks.

Based on information obtained during interviews of this accident, a roof fall in magnitude similar to the fall that resulted in the death of the victim occurred during the week of 8/18/03. Additionally, an examination of the section during the accident investigation revealed that a fall similar in nature and size occurred in the No. 5 entry which rode out the breaker posts and extended down the entry, but did not reach the intersection. Due to the numerous surface cracks present on the section at the time of the accident, the prior roof fall, and the hazards associated with pillar mining, additional measures should have been implemented to adequately support the mine roof.

ENFORCEMENT ACTIONS

Section 104(a) Citation for a violation of 30 CFR 75.360(b)(3)

The pre-shift examiner failed to properly examine the 1-Left Pillar Section for hazardous conditions. There were one dozen surface cracks that were identified on the section as part of the accident investigation that ranged between one and five inches wide and between 140 feet and 280 feet in length. Additionally, there were surface cracks in the crosscuts where six surface cracks extended from rib to rib. (See Citation No. 7146724 issued on the same date for an accurate description of the surface crack locations). This mine has experienced two unintentional roof falls. In addition to the numerous surface cracks present in the mine, the extensiveness of these surface cracks should have prompted identification of these hazardous roof conditions so that corrective actions could have been taken. Due to the hazards associated with mining, and specifically with pillar mining, measures should have been implemented to adequately support the mine roof to correct the hazardous condition or the area should have been dangered off and the section pulled back. The preshift record book did not contain any entries identifying the surface cracks or adverse roof conditions.

BEST PRACTICES

- Be alert for changing roof conditions.
- Install additional roof supports where necessary.
- Conduct a thorough visual examination of the roof, face, and ribs immediately before any work is started, and thereafter as conditions warrant.
- Apply additional safety precautions in areas where geological changes and anomalies in strata are present.
- Train all miners in proper escape and evacuation procedures during retreat mining.